In this section, we’re going to learn how to simplify \( \frac{1}{\frac{2}{\frac{3}{5}}} \) (fractions within other fractions). For example, \( \frac{\frac{3}{2}}{5} \) is a complex fraction.

There are 2 methods of simplifying complex fractions. Choose which one is easiest for you!

**Method I**
1. Simplify the numerator and denominator separately to a single fraction. (Find the LCD and combine.)
2. Perform indicated division by multiplying the numerator by the reciprocal of the denominator.
3. Simplify, if necessary. Leave in factored form.

**Example 1:** Simplify the following using Method I.

\[
\begin{align*}
\text{a)} & \quad \frac{4}{x} = \frac{x}{5} = \frac{2}{2x} \\
\text{b)} & \quad \frac{3 - \frac{2}{x}}{x - \frac{4}{9x}} \\
\text{c)} & \quad \frac{1}{\frac{1}{x^2} + \frac{1}{y^2}}
\end{align*}
\]
Method II
1. Multiply the numerator and denominator by the LCD of all fractions.
2. Simplify, as usual. Leave answers in factored form.

Note that this method tends to be easier for more difficult complex fractions.

Example 2: Simplify the following using Method II.

\[
\begin{align*}
a) & \quad \frac{4}{\frac{x}{5}} - \frac{\frac{x}{2x}}{5} \\
b) & \quad \frac{3 - \frac{2}{x}}{\frac{x}{4} - \frac{9}{9x}} \\
c) & \quad \frac{1}{\frac{x}{x^2} + \frac{1}{y^2}}
\end{align*}
\]

Example 3: Simplify the following, using either method.

\[
\frac{5x^{-2} - 3y^{-1}}{x^{-1} + y^{-1}}
\]